

Geometry Date_____ 1.4 Notes

Angles and Their Measures (pp 26–28)

Angles that have the same measure are called **congruent angles**. For instance, $\angle BAC$ and $\angle DEF$ each have a measure of 50° , so they are congruent.

MEASURES ARE EQUAL.

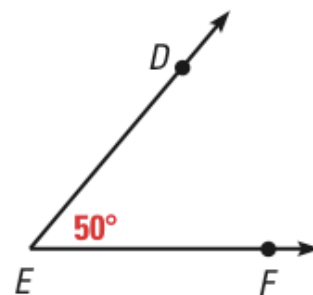
$$m\angle BAC = m\angle DEF$$

“is equal to”

ANGLES ARE CONGRUENT.

$$\angle BAC \cong \angle DEF$$

“is congruent to”

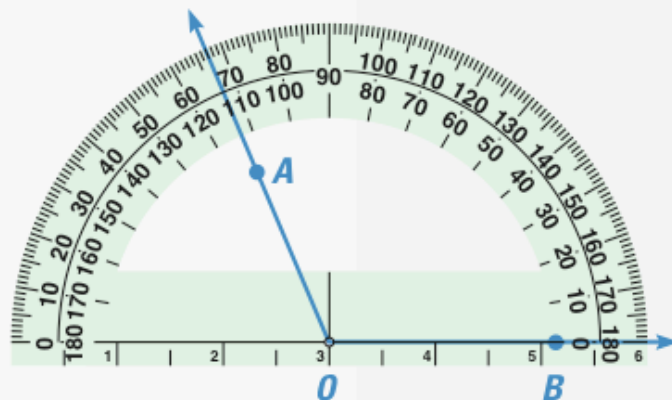


POSTULATE

POSTULATE 3 *Protractor Postulate*

Consider a point A on one side of \overleftrightarrow{OB} . The rays of the form \overrightarrow{OA} can be matched one to one with the real numbers from 0 to 180.

The **measure** of $\angle AOB$ is equal to the absolute value of the difference between the real numbers for \overrightarrow{OA} and \overrightarrow{OB} .

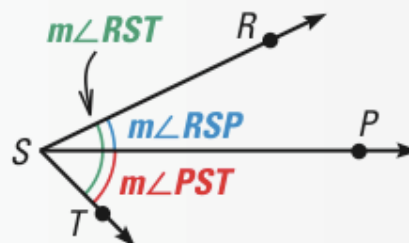


POSTULATE

POSTULATE 4 *Angle Addition Postulate*

If P is in the interior of $\angle RST$, then

$$m\angle RSP + m\angle PST = m\angle RST.$$

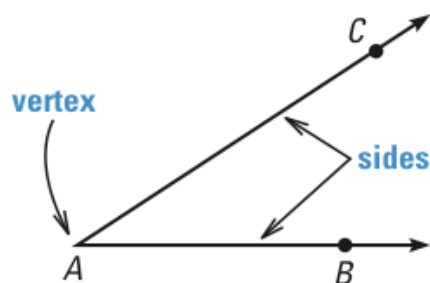


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An **angle** consists of two different rays that have the same initial point. The rays are the **sides** of the angle. The initial point is the **vertex** of the angle.

The angle that has sides \overrightarrow{AB} and \overrightarrow{AC} is denoted by $\angle BAC$, $\angle CAB$, or $\angle A$. The point A is the vertex of the angle.



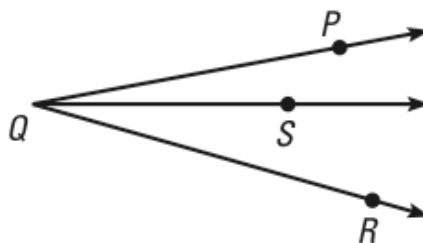
EXAMPLE 1 Naming Angles

Name the angles in the figure.

SOLUTION

There are three different angles.

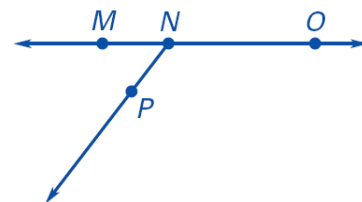
- $\angle PQS$ or $\angle SQP$
- $\angle SQR$ or $\angle RQS$
- $\angle PQR$ or $\angle RQP$



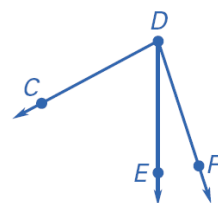
You should not name any of these angles as $\angle Q$ because all three angles have Q as their vertex. The name $\angle Q$ would not distinguish one angle from the others.

Name the angles in the figure

1. Name the angles in the figure.



2. Name the angles in the figure.

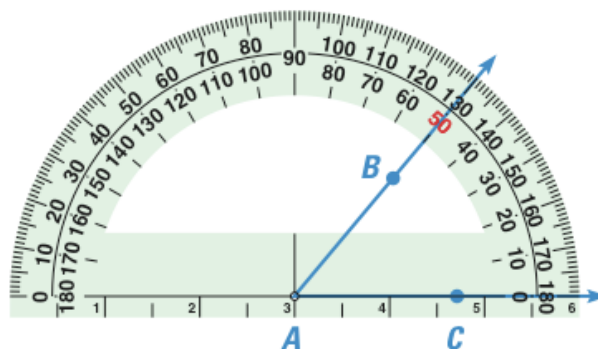


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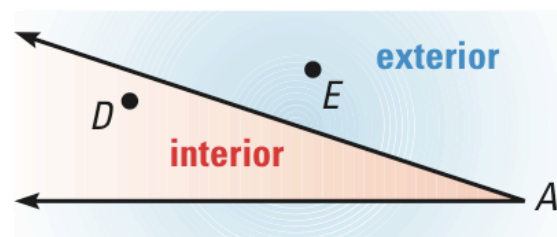
The *measure* of $\angle A$ is denoted by $m\angle A$. The measure of an angle can be approximated with a protractor, using units called *degrees* ($^\circ$). For instance, $\angle BAC$ has a measure of 50° , which can be written as

$$m\angle BAC = 50^\circ.$$



A point is in the **interior** of an angle if it is between points that lie on each side of the angle.

A point is in the **exterior** of an angle if it is not on the angle or in its interior.

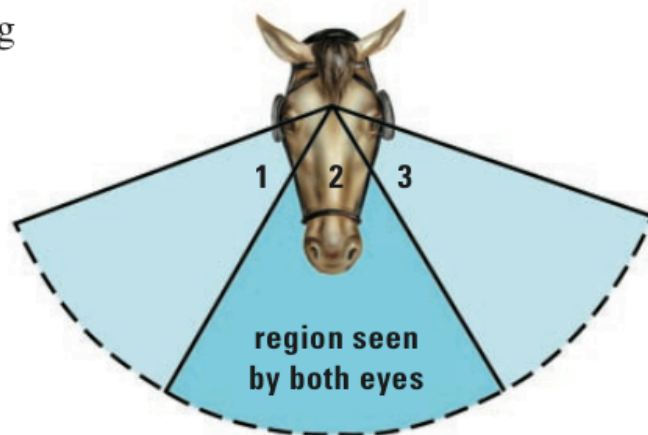


EXAMPLE 2 Calculating Angle Measures



VISION Each eye of a horse wearing blinkers has an angle of vision that measures 100° . The angle of vision that is seen by both eyes measures 60° .

Find the angle of vision seen by the left eye alone.



SOLUTION

You can use the Angle Addition Postulate.

$$m\angle 2 + m\angle 3 = 100^\circ$$

Total vision for left eye is 100° .

$$m\angle 3 = 100^\circ - m\angle 2$$

Subtract $m\angle 2$ from each side.

$$m\angle 3 = 100^\circ - 60^\circ$$

Substitute 60° for $m\angle 2$.

$$m\angle 3 = 40^\circ$$

Subtract.

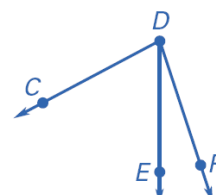
► So, the vision for the left eye alone measures 40° .

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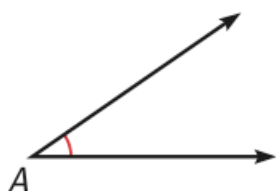
3. The backyard of a house is illuminated by a light fixture that has two bulbs. Each bulb illuminates an angle of 120° . If the angle illuminated only by the right bulb is 35° , what is the angle illuminated by both bulbs?

4. If $m\angle CDE = 62^\circ$ & $m\angle EDF = 18^\circ$, what is $m\angle CDF$?



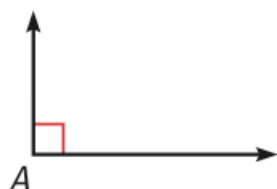
GOAL 2 CLASSIFYING ANGLES

Angles are classified as **acute**, **right**, **obtuse**, and **straight**, according to their measures. Angles have measures greater than 0° and less than or equal to 180° .



Acute angle

$$0^\circ < m\angle A < 90^\circ$$



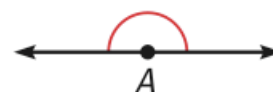
Right angle

$$m\angle A = 90^\circ$$



Obtuse angle

$$90^\circ < m\angle A < 180^\circ$$



Straight angle

$$m\angle A = 180^\circ$$



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EXAMPLE 3 *Classifying Angles in a Coordinate Plane*

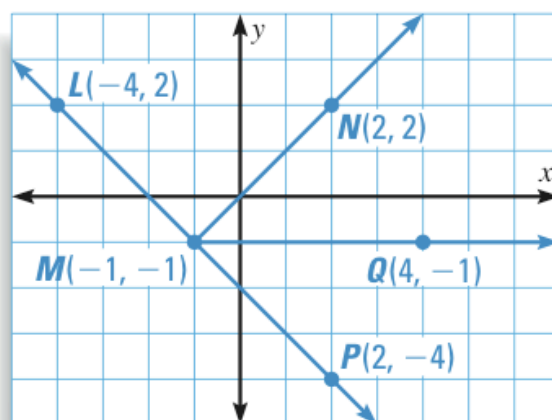
Plot the points $L(-4, 2)$, $M(-1, -1)$, $N(2, 2)$, $Q(4, -1)$, and $P(2, -4)$. Then measure and classify the following angles as acute, right, obtuse, or straight.

- a. $\angle LMN$ b. $\angle LMP$ c. $\angle NMQ$ d. $\angle LMQ$

SOLUTION

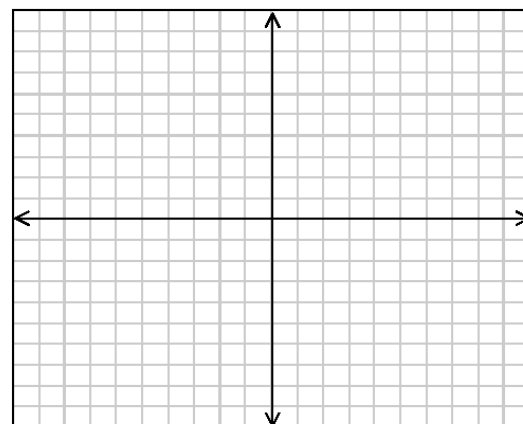
Begin by plotting the points. Then use a protractor to measure each angle.

MEASURE	CLASSIFICATION
a. $m\angle LMN = 90^\circ$	right angle
b. $m\angle LMP = 180^\circ$	straight angle
c. $m\angle NMQ = 45^\circ$	acute angle
d. $m\angle LMQ = 135^\circ$	obtuse angle
.....	



5. Plot the points $A(-3, -1)$, $B(-1, 1)$, $C(2, 4)$, $D(2, 1)$, and $E(2, -2)$. Then measure and classify the following angles as acute, right, obtuse, or straight.

- A. $\angle DBE$
- B. $m\angle EBC$
- C. $m\angle ABC$
- D. $m\angle ABD$



Two angles are **adjacent angles** if they share a common vertex and side, but have no common interior points.

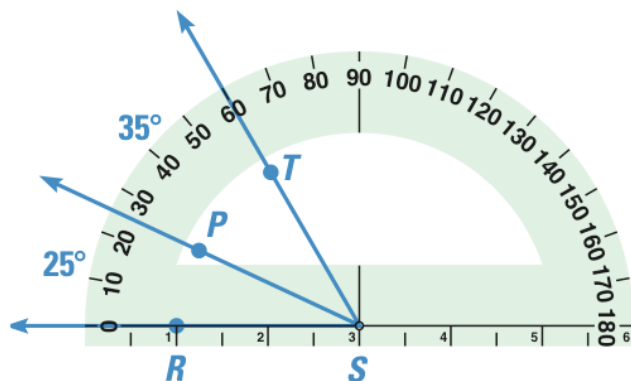
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EXAMPLE 4 *Drawing Adjacent Angles*

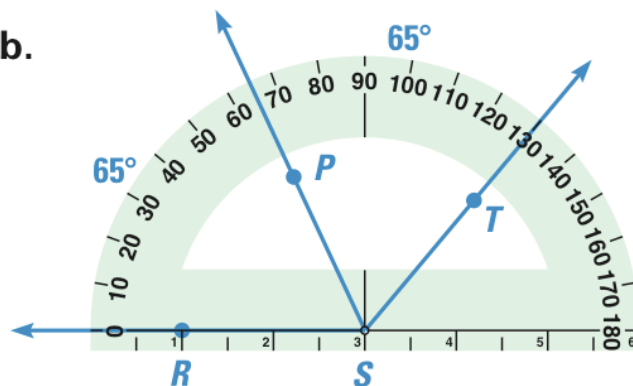
Use a protractor to draw two adjacent acute angles $\angle RSP$ and $\angle PST$ so that $\angle RST$ is (a) acute and (b) obtuse.

SOLUTION

a.



b.



6. Use a protractor to draw two adjacent angles $\angle LMN$ and $\angle NMO$ so that $\angle LMN$ is acute and $\angle LMO$ is straight.

7. Draw 5 points A, B, C, D, and E so that all four statements are true.

$\angle AEC$ and $\angle BEC$ are adjacent.

$\angle AEB$ is obtuse.

D is in the exterior of $\angle AEB$.

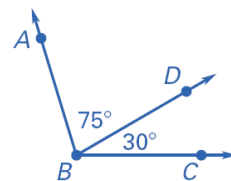
$\angle DEC$ is a right angle.

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8. _____ Find the measure of $\angle ABC$.

- A. 30°
- B. 45°
- C. 75°
- D. 105°
- E. 175°

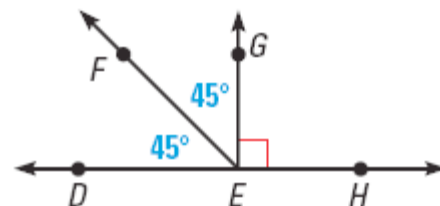


Match the angle with its classification.

9. _____	Right	A.	
10. _____	Obtuse	B.	
11. _____	Right	C.	
12. _____	Straight	D.	

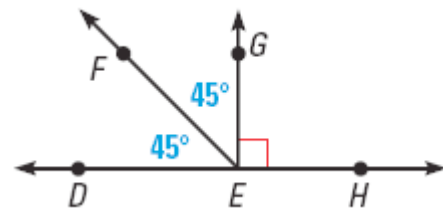
Use the diagram at the right to answer the questions. Explain your answers.

13. Is $\angle DEF \cong \angle FEG$?



14. Is $\angle DEG \cong \angle HEG$?

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Use the diagram at the right to answer the
questions. Explain your answers.



15. Are $\angle DEF$ and $\angle FEH$ adjacent?

16. Are $\angle GED$ and $\angle DEF$ adjacent?

